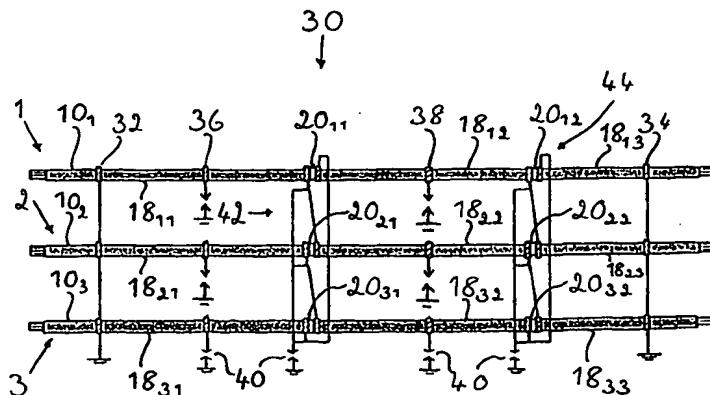




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)-

(51) International Patent Classification 6 : H01F 27/34		A3	(11) International Publication Number: WO 99/17312
			(43) International Publication Date: 8 April 1999 (08.04.99)
(21) International Application Number: PCT/SE98/01749		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, ES, FI, FI (Utility model), GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 29 September 1998 (29.09.98)			
(30) Priority Data: 9703563-8 30 September 1997 (30.09.97) SE			
(71) Applicant (for all designated States except US): ASEA BROWN BOVERI AB [SE/SE]; S-721 83 Västerås (SE).			
(72) Inventors; and			
(75) Inventors/Applicants (for US only): MING, Li [SE/SE]; Högbyskogsväg 1, S-723 41 Västerås (SE), LEIJON, Mats [SE/SE]; Hyvlargatan 5, S-723 35 Västerås (SE), LIU, Rongsheng [CN/SE]; Bangatan 1F, S-722 28 Västerås (SE), JAKSTS, Albert [CA/SE]; Ekorrvägen 13, S-722 43 Västerås (SE).			
(74) Agent: ASKERBERG, Fredrik; L.A. Groth & Co. KB, P.O. Box 6107, S-102 32 Stockholm (SE).			

(54) Title: POWER TRANSFORMER/REACTOR AND A METHOD OF ADAPTING A HIGH VOLTAGE CABLE



(57) Abstract

The present invention refers to a power transformer/reactor comprising at least one winding (1, 2, 3). The winding/windings (1, 2, 3) are manufactured with a high voltage cable (10), comprising an electric conductor, around the conductor there being arranged a first semiconducting layer (14), around the first semiconducting layer (14) there being arranged a first insulating layer (16) and around the first insulating layer (16) there being arranged a second semiconducting layer (18). The second semiconducting layer (18) is directly earthed (32, 34) at n points of each winding (1, 2, 3) wherein n is an integral number and n≥2, and whereby two (32, 34) of said n directly earthed points are arranged at or in the vicinity of both ends of each winding (1, 2, 3) and the electric contact is interrupted (20) 2(n-1) number of times between both ends in the semiconducting layer (18). At each said interruption (20) there is arranged a means (24, 26) comprising a second insulating layer (24) and third semiconducting layer (26) in order to reduce the amplification of electric field strength at said interruption (20). The second semiconducting layer (18) of different phases (1, 2, 3) at each said interruption (20) is earthed in a cross-connected manner (42, 44). Besides, at least one point (36, 38) between both ends is indirectly earthed.

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ENKEL: 8308

09/508683
416 Rec'd PCT/PTO 28 MAR 2000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Li MING, et al.

SERIAL NUMBER: NEW U.S. PCT APPLICATION (based on PCT/SE98/01749)

FILED: HEREWITH

FOR: POWER TRANSFORMER/REACTOR AND A METHOD OF ADAPTING A HIGH VOLTAGE CABLE

**REQUEST FOR CONSIDERATION OF DOCUMENTS
CITED IN INTERNATIONAL SEARCH REPORT**

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

In the matter of the above-identified application for patent, notice is hereby given that applicant(s) request that the Examiner consider the documents cited in the International Search Report according to MPEP §609 and so indicate by a statement in the first Office Action that the information has been considered. When the Form PCT/DO/EO/903 indicates both the search report and copies of the documents are present in the national stage file, there is no requirement for the applicant(s) to submit them (1156 O.G. 91 November 23, 1993).

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

WILLIAM E. BEAUMONT
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(OSMMN 1/97)

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PCT

INTERNATIONAL SEARCH REPORT
(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P 98-308/FA	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/SE 98/01749	International filing date (day/month/year) 29 Sept 1998	(Earliest) Priority Date (day/month/year) 30 Sept 1997
Applicant Asea Brown Boveri AB et al		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1. Certain claims were found unsearchable (See Box I).
2. Unity of invention is lacking (See Box II).
3. The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing
 - filed with the international application.
 - furnished by the applicant separately from the international application,
 - but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
 - transcribed by this Authority.
4. With regard to the title, the text is approved as submitted by the applicant.
 - the text has been established by this Authority to read as follows:
5. With regard to the abstract,
 - the text is approved as submitted by the applicant.
 - the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. The figure of the drawings to be published with the abstract is:
 - Figure No. 4 as suggested by the applicant.
 - because the applicant failed to suggest a figure.
 - because this figure better characterizes the invention.
 - None of the figures.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/01749

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H01F 27/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EDOC, WPIL, JAPIO

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5036165 A (RICHARD K. ELTON ET AL), 30 July 1991 (30.07.91), abstract --	1,21
A	US 4109098 A (MATS GUNNAR OLSSON ET AL), 22 August 1978 (22.08.78), abstract -----	1,21

 Further documents are listed in the continuation of Box C. See patent family annex.

- * Special categories of cited documents:
- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed
- "I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 April 1999	29 -04- 1999
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer: Magnus Westöö Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

Information on patent family members

02/03/99

International application No.

PCT/SE 98/01749

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5036165 A	30/07/91	US 5066881 A	19/11/91
		US 5067046 A	19/11/91
		CA 1245270 A	22/11/88
		US 4853565 A	01/08/89
US 4109098 A	22/08/78	AR 211382 A	15/12/77
		AU 7707175 A	08/07/76
		BE 825068 A	15/05/75
		BR 7500229 A	04/11/75
		CA 1038052 A	05/09/78
		CH 587545 A	13/05/77
		DE 2501811 A	14/08/75
		DK 32675 A	29/09/75
		FI 68477 B,C	31/05/85
		FI 750213 A	01/08/75
		FR 2260173 A,B	29/08/75
		GB 1493163 A	23/11/77
		JP 50109479 A	28/08/75
		NL 7501168 A	04/08/75
		SE 384420 B,C	03/05/76
		SE 7401244 A	01/08/75

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PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

To:

ASKERBERG, Fredrik
 L.A. Groth & Co. KB
 P.O. Box 6107
 S-102 32 Stockholm
 SUÈDE

Date of mailing (day/month/year)
 16 September 1999 (16.09.99)

Applicant's or agent's file reference
 P 98-308/FA

IMPORTANT NOTIFICATION

International application No.
 PCT/SE98/01749

International filing date (day/month/year)
 29 September 1998 (29.09.98)

1. The following indications appeared on record concerning:

the applicant the inventor the agent the common representative

Name and Address
 ASEA BROWN BOVERI AB
 S-721 83 Västerås
 Sweden

State of Nationality SE	State of Residence SE
Telephone No.	
Facsimile No.	
Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

the person the name the address the nationality the residence

Name and Address
 ABB AB
 S-721 83 Västerås
 Sweden

State of Nationality SE	State of Residence SE
Telephone No.	
Facsimile No.	
Teleprinter No.	

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned
<input checked="" type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:

The International Bureau of WIPO
 34, chemin des Colombettes
 1211 Geneva 20, Switzerland
 Facsimile No.: (41-22) 740.14.35

Authorized officer
 Beatriz Morariu
 Telephone No.: (41-22) 338.83.38

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PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF ELECTION
(PCT Rule 61.2)

To:
 United States Patent and Trademark
 Office
 (Box PCT)
 Crystal Plaza 2
 Washington, DC 20231
 ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 17 June 1999 (17.06.99)	
International application No. PCT/SE98/01749	Applicant's or agent's file reference P 98-308/FA
International filing date (day/month/year) 29 September 1998 (29.09.98)	Priority date (day/month/year) 30 September 1997 (30.09.97)
Applicant MING, Li et al	

1. The designated Office is hereby notified of its election made:

 in the demand filed with the International Preliminary Examining Authority on:

26 April 1999 (26.04.99)

 in a notice effecting later election filed with the International Bureau on:

2. The election was was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Jean-Marie McAdams Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P 98-308 FA/uh	FOR FURTHER ACTION		See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/SE98/01749	International filing date (day/month/year) 29.09.1998	Priority date (day/month/year) 30.09.1997	
International Patent Classification (IPC) or national classification and IPC7 H 01 F 27/34			
Applicant ABB AB et al			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I Basis of the report
- II Priority
- III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV Lack of unity of invention
- V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI Certain documents cited
- VII Certain defects in the international application
- VIII Certain observations on the international application

Date of submission of the demand 26.04.1999	Date of completion of this report 08.12.1999	
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Telex 17978 PATOREG-S	Authorized officer Magnus Westöö/MN Telephone No. 08-782 25 00

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE98/01749

I. Basis of the report

1. This report has been drawn on the basis of (Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.):

the international application as originally filed.

the description, pages _____, as originally filed,
pages _____, filed with the demand,
pages _____, filed with the letter of _____
pages _____, filed with the letter of _____

the claims, Nos. _____, as originally filed,
Nos. _____, as amended under Article 19,
Nos. _____, filed with the demand,
Nos. _____, filed with the letter of _____
Nos. _____, filed with the letter of _____

the drawings, sheets/fig _____, as originally filed,
sheets/fig _____, filed with the demand
sheets/fig _____, filed with the letter of _____
sheets/fig _____, filed with the letter of _____

2. The amendments have resulted in the cancellation of:

the description, pages _____

the claims, Nos. _____

the drawings, sheets/fig _____

3. This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE98/01749

V. Resoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-27	YES
	Claims	_____	NO
Inventive step (IS)	Claims	1-27	YES
	Claims	_____	NO
Industrial applicability (IA)	Claims	1-27	YES
	Claims	_____	NO

2. Citations and explanations

Cited documents:

D1: US 5036165 A
D2: US 4109098 A

The invention relates to a power transformer/reactor. The winding/windings are manufactured with a high voltage cable, comprising an electric conductor, around the conductor there being arranged a first semiconducting layer, around the first semiconducting layer there being arranged a first insulating layer and around the first insulating layer there being arranged a second semiconducting layer, whereby the second semiconducting layer is directly earthed, as defined in claim 1. The invention also relates to a method for adjusting a high voltage cable for windings in a power transformer/reactor.

D1 and D2 each disclose a cable comprising two semiconducting layers and an intermediate insulation.

D1 and D2 show the state of the art technology, but do not anticipate the claimed invention. The invention is novel, and is considered to involve an inventive step. The industrial applicability of the invention is obvious.

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